



Title III Section 313 Release Reporting Guidance

*Estimating Chemical Releases From
Presswood and Laminated Wood
Products Manufacturing*

**Emergency Planning and
Community Right-to-Know Act of 1986**

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9. The ninth part of the document is a report from the Secretary of the Education, dated January 1, 1861. It is a very important document, as it sets out the Secretary's policy for the new year. The report is written in a very formal and dignified style, and it is a very good example of the Secretary's power and authority.

Estimating Chemical Releases From Presswood and Laminated Wood Products Manufacturing

Facilities engaged in the manufacture of presswood and laminated wood products may be required to report annually any releases to the environment of certain chemicals regulated under Section 313, Title III, of the Superfund Amendments and Reauthorization Act (SARA) of 1986. If your facility is classified under SIC codes 20 through 39 (presswood and laminated wood facilities generally fall under SIC codes 2435, 2436, 2492, and 2499) and has 10 or more full-time employees, for calendar year 1987 you must report all environmental releases of any Section 313-listed chemical or chemical category manufactured or processed by your facility in an amount exceeding 75,000 pounds per year or otherwise used in an amount exceeding 10,000 pounds per year. For calendar years 1988 and 1989 (and beyond), the threshold reporting quantity for manufactured or processed chemicals drops to 50,000 and 25,000 pounds per year, respectively.

This document has been developed to assist those who manufacture presswood and laminated wood products in the completion of Part III (Chemical Specific Information) of the Toxic Chemical Release Inventory Reporting Form. Included herein is general information on toxic chemicals used and process wastes generated, along with several examples to demonstrate the types of data needed and various methodologies available for estimating releases. If your facility performs other operations in addition to the manufacture of presswood and laminated wood products, you must also include any releases of toxic chemicals from these operations.

Step One

Determine if your facility processes or uses any of the chemicals subject to reporting under Section 313.

A suggested approach for determination of the chemicals your facility uses that could be subject to reporting requirements is to make a detailed review of the chemicals and materials you have purchased. If you do not know the specific ingredients of a chemical formulation, consult your suppliers for this information. If they will not provide this information, you must follow the steps outlined to handle this eventuality in the instructions provided with the Toxic Chemical Release Inventory Reporting Form.

The list presented here includes chemicals typically used in the manufacture of presswood and laminated wood products that are subject to reporting under Section 313. This list does not necessarily include all of the chemicals your facility uses that are subject to reporting, and it may include many chemicals that you do not use. You should also determine whether any of the listed chemicals are created during processing at your facility.

Phenol-formaldehyde resins: Phenol, formaldehyde

Urea-formaldehyde resin: Formaldehyde

Melamine-formaldehyde resins: Melamine, formaldehyde

Dispersion agent (during glue formulation): Sodium hydroxide

Resin catalysts: Ammonium sulfate, various acids

Chemicals used in finishing operations:

Miscellaneous chemicals found in coatings, stains and dyes, fillers, inks, fire retardants, and overlay materials

Formaldehyde scavengers: Ammonia, ammonium sulfate

Step Two

Determine if your facility surpassed the threshold quantities established for reporting of listed chemicals last year.

You must submit a separate Toxic Chemical Release Inventory Reporting Form for each listed chemical that is "manufactured," "processed," or "otherwise used" at your facility in excess of the threshold quantities presented earlier. Manufacture includes materials produced as byproducts or impurities. Toxic compounds that are incorporated into your products (for example, the free formaldehyde present in glue mixtures applied to the wood) would be considered "processed" because they become part of the marketed finished product. Dispersion agents, resin catalysts, degreasing solvents, cleaning agents, and other chemicals that do not become part of the finished product would be considered "otherwise used."

The amount of a chemical processed or otherwise used at your facility represents the amount purchased during the year, adjusted for beginning and ending inventories. To ascertain the amount of chemical in a mixed formulation, multiply the amount of the mixture (in pounds) by the concentration of

the chemical (weight percent) to obtain the amount of chemical processed.

Example: Determining whether formaldehyde was used in sufficient quantities to require reporting under Section 313.

Trace quantities of free formaldehyde and phenol are contained in phenol-formaldehyde resin purchased to formulate plywood glue. According to the supplier's Material Safety Data Sheet (MSDS), this particular resin contains 0.2 percent free formaldehyde and 0.03 percent free phenol by weight. Under Section 313 reporting, amounts of chemicals present in purchased mixtures that are below the de minimis level of 1 percent (0.1 percent for carcinogens) do not have to be considered in threshold and release calculations. Therefore, no reporting is required for phenol. With regard to formaldehyde, however, because OSHA classifies it as a carcinogen and its concentration exceeds 0.1 percent, this amount must be counted toward determination of threshold. If 15,000,000 pounds of this resin was purchased in 1987, 1,300,000 pounds was in storage at the beginning of the year, and 700,000 pounds was in storage at the end of the year, the amount of resin processed would equal:

$$\begin{aligned} &1,300,000 \text{ lb (beginning inventory)} + \\ &15,000,000 \text{ lb (purchased)} - \\ &700,000 \text{ lb (ending inventory)} \\ &= 15,600,000 \text{ lb} \end{aligned}$$

The amount of formaldehyde processed equals:

$$\begin{aligned} &15,600,000 \text{ lb} \times 0.2\% \\ &= 31,200 \text{ lb} \end{aligned}$$

Therefore, for the reporting year 1987, formaldehyde was not processed in

sufficient quantity to require reporting. Reporting also would not be required in 1988. In 1989 and beyond, however, this quantity of formaldehyde would trigger the reporting requirement.

A listed chemical may be a component of several formulations you purchase, so you may need to ask your supplier for information on the concentration (percentage) of the chemical in each. For chemical categories, your reporting obligations are determined by the total amounts of all chemicals in the category.

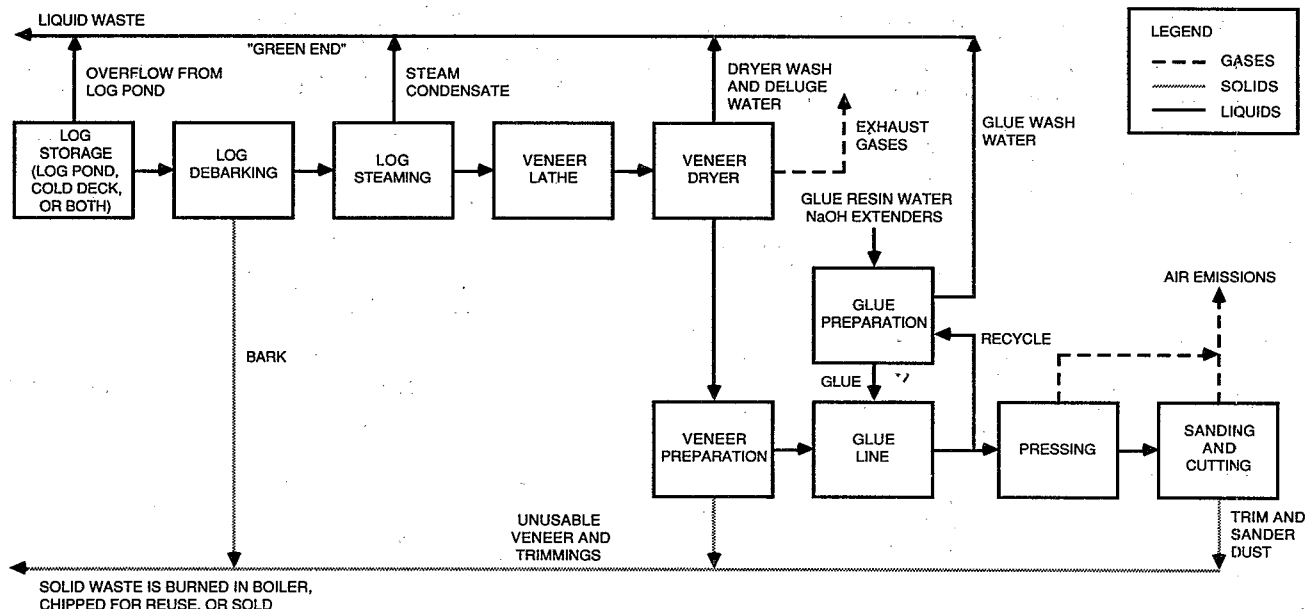
You must complete a report for each chemical for which a threshold is exceeded. The thresholds apply separately; therefore, if you both process and use a chemical and either threshold is exceeded, you must report for both activities. If neither threshold is exceeded, no report is needed.

Step Three

Identify points of release for the chemical(s) subject to reporting.

An effective means of evaluating points of release for listed toxic chemicals is to draw a process flow diagram identifying the operations performed at your facility. The figure shown below is an example flow diagram of veneer and plywood production. Because each facility is unique, you are strongly urged to develop a flow diagram for your particular operations that details the input of materials and chemicals and the waste sources resulting from the operation of each unit.

Air emissions at presswood and laminated wood production facilities are primarily from pressing and drying operations. Other sources include emissions from sanding and cutting and fugitive emissions from wood-finishing operations. Wastewater is typically generated as a result of process equipment



Example Flow Diagram of Veneer and Plywood Production

cleaning (glue wash water), fire protection, and the overflow from log storage. Solid wastes usually consist of wood scraps and dust, which are often used as fuel for onsite boilers. Solid wastes also may be generated in finishing operations. Your reporting must account for all releases.

Step Four

Estimate releases of toxic chemicals.

After all of the toxic chemicals and waste sources have been identified, you can estimate the releases of the individual chemicals. Section 313 requires that releases to air, water, and land and transfers to offsite facilities be reported for each toxic chemical meeting the threshold reporting values. The usual approach entails first estimating releases from waste sources at your facility (that is, wastewater, air release points, and solid waste) and then, based on the disposal method used, determining whether releases from a particular waste source are to air, water, land, or an offsite disposal facility.

In general, there are four types of release estimation techniques:

- **Direct measurement**
- **Mass balance**
- **Engineering calculations**
- **Emission factors**

Descriptions of these techniques are provided in the EPA general Section 313 guidance document, *Estimating Releases and Waste-Treatment Efficiencies for the Toxic Chemical Release Inventory Form*.

Provisions of the Clean Air Act, Clean Water Act, Resource Conservation and Recovery Act, and other regulations require monitoring of certain waste streams. If available, data gathered for these purposes can be used to estimate releases. When only a small amount of direct measurement data is available, you must decide if another estimation technique would give a more accurate estimate. Mass balance techniques and engineering assumptions and calculations can be used in a variety of situations to estimate toxic releases. These methods of estimation rely heavily on process operating parameters; thus, the techniques developed are very site-specific. Emission factors are available for some industries in publications referenced in the general Section 313 guidance document. Also, emission factors for your particular facility can be developed in-house by performing detailed measurements of wastes at different production levels.

At many presswood and laminated wood production facilities, the primary sources of listed toxic compounds are glue resins and adhesives. These materials contain small quantities of the toxic resin precursors in a free or unpolymerized state. During processing, the small quantities of free phenols, formaldehyde, or melamine in the glue resins may follow any of the paths listed below:

- Release to air during glue preparation, glue application, and pressing
- Polymerization during pressing
- Retention in the product
- Retention in scrap and subsequent combustion as fuel on site
- Release in wastewater during washing of glue tanks and lines

The primary difficulty in estimating releases of these chemicals is determining what happens to them during pressing. A mass balance combined with engineering assumptions can be used for this purpose:

$$\begin{aligned} \text{Amount of chemical in purchased resin} = & \\ & \text{amount released to air} + \\ & \text{amount polymerized during pressing} + \\ & \text{amount retained in product} + \\ & \text{amount retained in scrap and burned} \\ & \text{for fuel} + \\ & \text{amount discharged as wastewater} \\ & \text{during cleanup of glue tanks and} \\ & \text{lines} \end{aligned}$$

Toxic Releases to Air

The simplest technique for estimating releases to the air is to assume that all the trace quantities of free chemical are volatilized during pressing and are released. Although this will result in an overestimation of emissions, it will give a rough idea of the magnitude of the release.

The mass balance approach can be used if enough detailed information is available on the fate of the chemical in various pathways. Almost all facilities recycle glue-equipment wash water in the preparation of new batches of glue. If this is the practice at your plant, no release of toxic chemicals should occur via wastewater. Perforator test data on boards, acknowledged to be a good indicator of the free formaldehyde content in pressed panels, can be used to estimate the quantity of formaldehyde retained in the product and in the scrap wood. The quantities of free formaldehyde that react during board manufacture are generally not known, but most of the free formaldehyde is believed to be taken up during the crosslinking reaction. The press area is the largest contributor to total plant formaldehyde emissions. Note: the overall mass balance does not take into account the use of formaldehyde scavengers, which could have a significant effect on air emissions depending on the point in the process where they are used.

In a survey of formaldehyde emissions from particleboard plants, the National Council for Air and Steam Improvement (NCASI) determined average formaldehyde emission rates related to percentage of excess formaldehyde in the resin. The processing parameters that were found to have an impact on formaldehyde emission rates were 1) excess formaldehyde in the resin, 2) press temperature, 3) press cycle time, 4) amount of adhesive used, and 5) the use of formaldehyde scavengers. Results of the survey are shown below:

Formaldehyde Emissions Survey Data

Parameter	Average	Range
Emitted formaldehyde:		
lb/1000 ft ² (3/4-inch board)	0.51	0.22 - 0.84
As % of excess HCHO in resin	4.7	1.9 - 12
Conditions:		
Press temperature (° F)	339	315 - 385
lb resin/1000 ft ² (3/4-inch board)	216	150 - 290
% excess HCHO in resin (dry basis)	5.9	3.2 - 7.7

Many plants use resins that contain less than 1 percent free formaldehyde. In lieu of more detailed data needed to estimate air emissions via a mass balance, however, the average percentage of excess formaldehyde in resin emitted could be used to estimate releases.

Example: Using an average emission factor to estimate air releases of formaldehyde.

In its gluing operations, a particleboard manufacturing facility used 36,000 pounds per day of a urea-formaldehyde resin containing 1.0 percent free formaldehyde. This facility produced an average of 300 tons of particleboard per day.

Amount of excess formaldehyde in resin =
 $36,000 \text{ lb/day} \times 0.01$
 $= 360 \text{ lb/day}$

Assuming an average of 4.7 percent of the excess formaldehyde is emitted:

Amount of formaldehyde released to air =
 $360 \text{ lb/day} \times 0.047$
 $= 17 \text{ lb/day}$

These emissions would be reported as stack emissions if exhausted through the building ventilation system.

Toxic Releases Via Wastewater

Wastewater is usually not measured directly for specific toxic chemicals. In lieu of this information, mass balances and/or engineering calculations can be used to estimate wastewater releases from individual processes. Equipment washdowns generate most of the wastewater containing toxic compounds.

One method of estimating releases is to calculate how much material is lost during each washdown and then to multiply that amount by the number of washdowns per year. Multiplying this result by the percentage of a toxic chemical in the material will then yield the quantity released via wastewater. The quantity of material lost per washdown can be determined by in-house measurements, or it can be assumed (for vessels) that the weight of material lost is equal to 1 percent of the total weight capacity of the vessel or tank. The following is an example of the use of this procedure.

Example: Using an engineering calculation to estimate releases of formaldehyde in wastewater.

A veneer/plywood facility discharged glue equipment wash water to a publicly owned wastewater treatment plant (direct discharge to streams or other bodies of water is forbidden). The plant has 3 mixing tanks, each with a capacity of 4,000 gallons. The piping associated with each tank has a capacity of 6.5 gallons.

The total capacity of these vessels is therefore:

$(3 \text{ tanks} \times 4,000 \text{ gal}) +$
 $(3 \text{ tanks} \times 6.5 \text{ gal/associated piping})$
 $= 12,020 \text{ gal}$

If the glue density is known to be 9.17 pounds per gallon and the amount of glue residual left on the sides of the mixing tank and associated piping is assumed to be 1 percent of the capacity of the tank and piping, the quantity of glue lost per washdown is:

$12,020 \text{ gal (capacity)} \times$
 $9.17 \text{ lb glue/gal} \times$
 $0.01 \text{ lb glue/weight capacity of vessel}$
 $= 1,102 \text{ lb glue}$

The plant performed one washdown per day and operated 250 days per year. Thus, the total quantity of glue lost per year is:

$1,102 \text{ lb} \times 250 \text{ days}$
 $= 275,550 \text{ lb glue}$

On average, the glue formulation used at this facility contained 50 percent raw resin solution containing 0.2 percent formaldehyde. Thus, the total quantity of formaldehyde released in wastewater per year is:

$275,550 \text{ lb} \times 0.50 \times 0.002$
 $= 276 \text{ lb formaldehyde}$

Using this approach, the plant in this example could report releases of 280 pounds of formaldehyde to wastewater.

If your facility uses a listed mineral acid or base but this acid or base is effectively neutralized in use or during wastewater treatment (to pH 6 to 9, as required by most effluent standards), no release quantities should be reported. If the acid or base is transformed into a reportable substance, however, you must estimate the quantity of this substance manufactured to determine if

the "manufactured" threshold value has been reached. For example, sulfuric acid neutralized by sodium hydroxide yields sodium sulfate, which is a listed chemical.

Toxic Releases Via Solid Waste

Solid wastes from presswood and laminated wood production facilities consist primarily of wood scraps and dust from trimming operations. If this material is used as fuel in an onsite boiler, it may be assumed that no toxic chemicals are released in this form. If the scrap wood contains compounds that are not completely destroyed during combustion, however, you must account for the release of these compounds. If the wood scraps are shipped offsite or landfilled, any toxic compounds that have been incorporated into the wood are considered transferred to an offsite facility or released to land, respectively.

Example: Using measured process data to estimate solid waste releases of formaldehyde.

A particleboard facility produces an average of 300 tons of particleboard per day and estimates that the wood trim and dust wastes generated amount to 10 percent of total particleboard production. The wood waste is generated 250 days per year and is shipped offsite. Perforator tests routinely performed on samples of particleboard average 30 milligrams of formaldehyde per 100 grams of particleboard (30 pounds formaldehyde per 50 tons of product).

The quantity of free formaldehyde retained in the wood waste can be calculated as follows:

Amount of formaldehyde transferred offsite in solid waste =

$$\begin{aligned} &300 \text{ tons/day} \times 0.1 \times \\ &30 \text{ lb formaldehyde/50 tons board} \times \\ &250 \text{ days/year} \\ &= 4,500 \text{ lb} \end{aligned}$$

Other Toxic Releases

Other wastes in the presswood and laminated wood products industry from which toxic chemicals may be released include:

- **Residues from pollution control devices**
- **Product rejects**
- **Used equipment**
- **Empty chemical containers**

Releases from these sources may already have been accounted for, depending on the release estimation methods used. These items (and any other of a similar nature) should be included in your development of a process flow diagram.

The contribution of sources of wastes such as discarding containers should be small compared with process losses. If you do not have data on such sources (or any monitoring data on overall water releases), assume up to 1 percent of vessel content may be lost during each cleaning occurrence. For example, if you discard (to landfill) "empty" drums that have not been cleaned, calculate the release as 1 percent of normal drum content. If the drums are washed before disposal, this may contribute 1 percent of the content to your wastewater loading.

Step Five

Complete the Toxic Chemical Release Inventory Reporting Form.

After estimating the quantity of each chemical released via wastewater, solid waste, and air emissions, you must determine the amount of each chemical released to water, land, or air or transferred to an offsite disposal facility. This determination will be based on the disposal method you use for each of your waste streams. Enter the release estimates for each chemical or chemical category in Part III of the Toxic Chemical Release Inventory Reporting Form. Also enter the code for each treatment method used, the weight percent by which the treatment reduces the chemical in the treated waste stream, and the concentration of the chemical in the influent to treatment (see instructions). Report treatment methods that do not affect the chemical by entering "0" for removal efficiency.

For More Information

**Emergency Planning
and Community
Right-to-Know
Hotline** (800) 535-0202
or
(202) 479-2449
(in Washington, D.C.
and Alaska)

**Small Business
Ombudsman
Hotline** (800) 368-5888
or
(703) 557-1938
(in Washington, D.C.
and Virginia)

The EPA brochure, *Emergency Planning and Community Right-to-Know Act, Section 313 Release Reporting Requirements* (EPA 560/4-88-001) presents an overview of the new law. It identifies the types of facilities that come under the provisions of Section 313, the threshold chemical volumes that trigger reporting requirements, and what must be reported. It also contains a complete listing of the chemicals and chemical categories subject to Section 313 reporting. The EPA publication, *Estimating Releases and Waste-Treatment Efficiencies for the Toxic Chemical Release Inventory Form* (EPA 560/4-88-002), presents more detailed information on general release estimation techniques than is included in this document.

Additional Sources of Information on Releases From Presswood and Laminated Wood Products Manufacturing

U.S. Environmental Protection Agency.
*Compilation of Air Pollutant Emission
Factors, AP-42.* Research Triangle Park,
North Carolina. September 1985.

U.S. Environmental Protection Agency.
*Control Techniques for Organic Emissions
From Plywood Veneer Dryers.* EPA-450/3-
83-012. NTIS No. PB83-228247. May 1983.

U.S. Environmental Protection Agency.
*Multimedia Pollution Assessment of the Wood
Products Industries.* EPA-600/2-81-008.
NTIS No. PB84-160266. February 1984.

U.S. Department of the Interior, Federal
Water Pollution Control Association. *Plywood
Plant Glue Wastes Disposal.* Technical
Projects Report No. FR-5. NTIS No. PB-
217183. January 1969.

U.S. Environmental Protection Agency. *Eval-
uation of Emission Factors for Formaldehyde
From Certain Wood Processing Operations.*
EPA 450/3-87-023. October 1987.



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